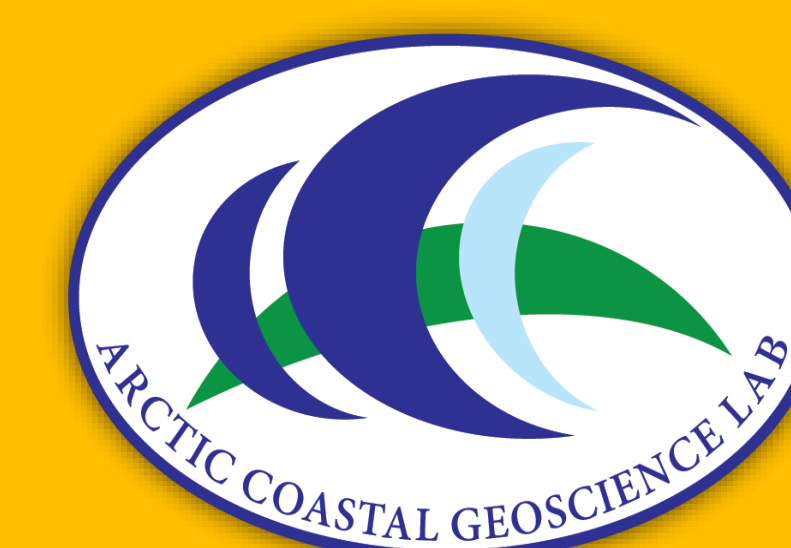


Raising the Stakes for Stakeholders: TEK and Community-based Approaches to Evaluating Coastal Flooding and Erosion

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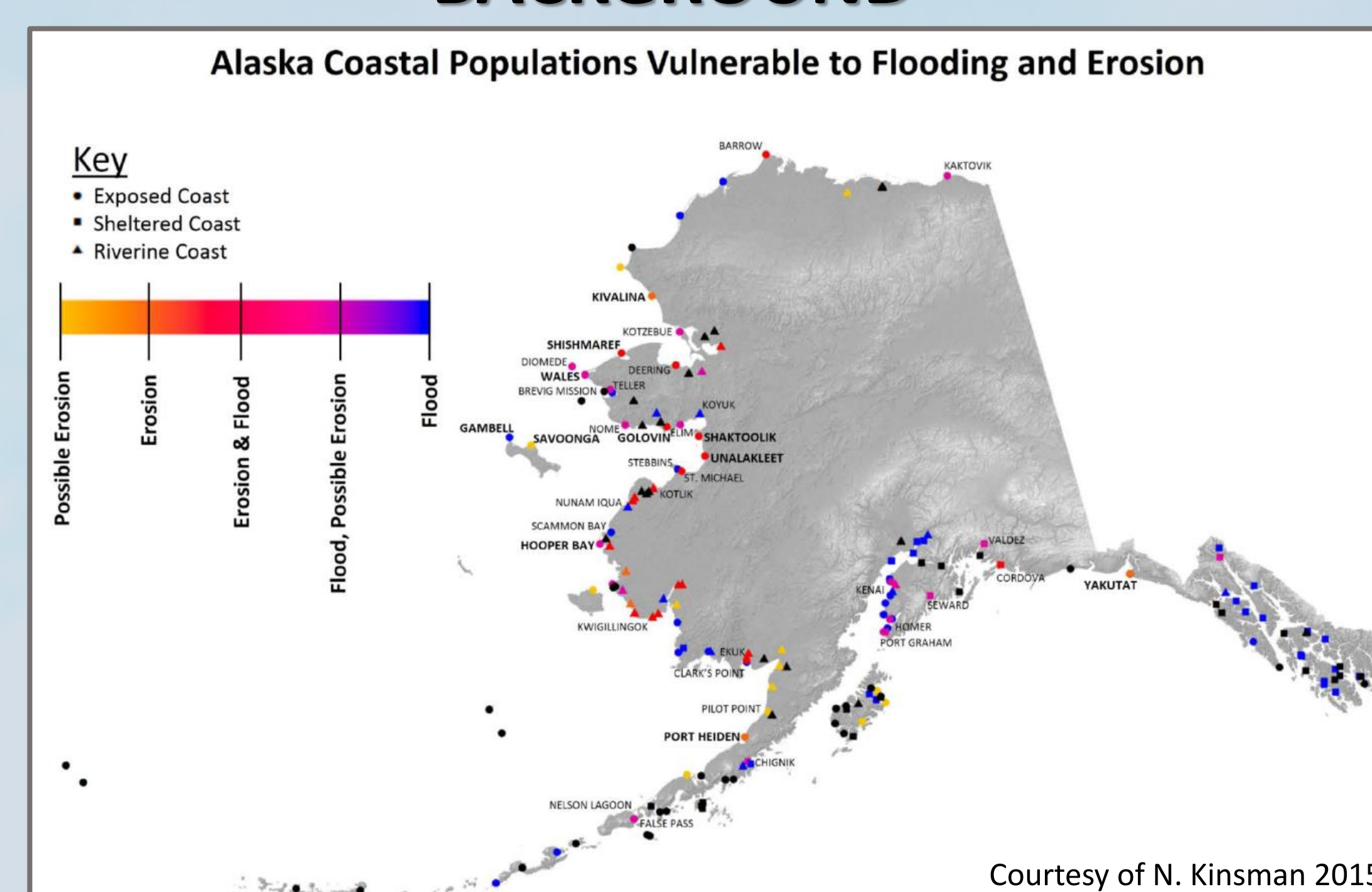


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ABSTRACT

The majority of Alaska's rural communities are located near oceans, rivers, and lakes for transportation, subsistence, and income purposes. The United States General Accounting Office reported in 2004 that flooding and erosion affects 184 out of 213 (86%) of Alaska Native villages, and most of these are coastal communities. As ongoing processes and emerging climate-driven perturbations to the natural environment shape the land at the water's edge, more information is needed about how those changes will affect the resiliency of coastal communities. Alaska's extensive coastlines are inconsistently monitored and under-instrumented for the evaluation of coastal flooding and erosion, leaving them vulnerable and lacking the necessary tools for appropriate mitigation and adaptation strategies. By combining coastal education programs, traditional ecological knowledge (TEK), and community-based monitoring systems, not only can scientists potentially lengthen the historical record of sea levels, storms, and sea ice extent back to the early 19th century, but can sustain a higher frequency of measurements for longer-term efforts and promote the awareness of coastal processes. Additionally, the inclusion of elder-derived TEK and community-based monitoring also serve to develop positive relationships with community stakeholders, enhancing their ability to interpret, understand, and act upon research results.

BACKGROUND



Map of communities at risk to coastal flooding, erosion, or both along with coastal setting.

Despite the need for historical measurements and long-term monitoring, much of the coast of Alaska is under-measured and under-instrumented for the evaluation of coastal geohazards. DGGS and UAF are working to fill gaps using the following methods:

- Documenting TEK of past storms with high-grade DGPS for inclusion in storm surge vulnerability mapping
- Providing educational programs
- Using time-lapse imagery in combination with surveyed stake locations to empower local observers to document environmental change

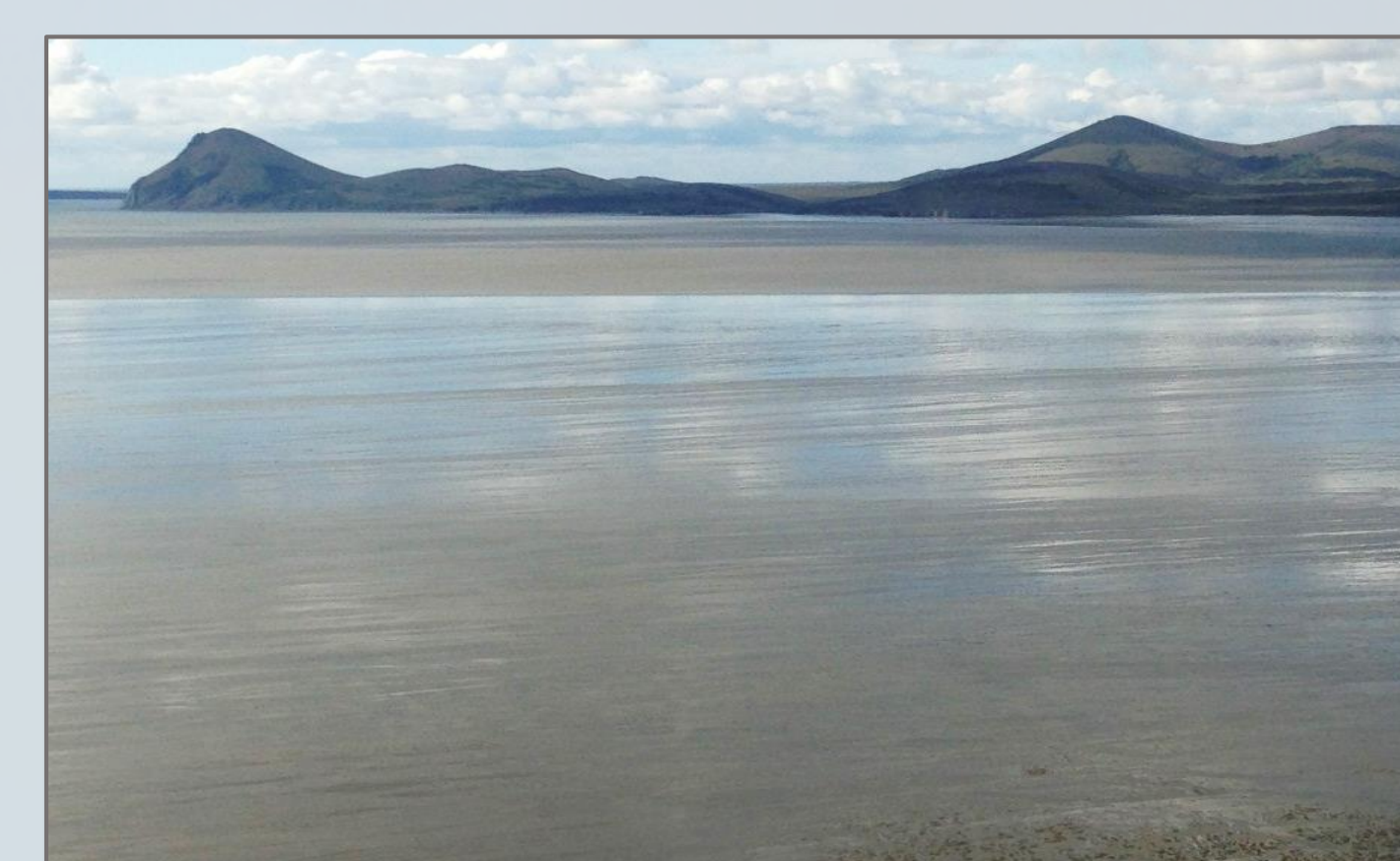
GOODNEWS BAY: COASTAL EDUCATION PROGRAM AND INTEGRATION OF TRADITIONAL ECOLOGICAL KNOWLEDGE



Rocky Mountain School students assist in collection of GPS data.

EDUCATION GOALS

- Engage students through data collection
- Provide in-person and distance delivery classroom visits
- Train citizen scientists
- Provide the education and training necessary to promote informed coastal management decision making
- Develop pathway to higher education



Elders have observed an increase in mudflats fronting the village



Map drawn by Willie Ayojiak showing location of former village and airport.

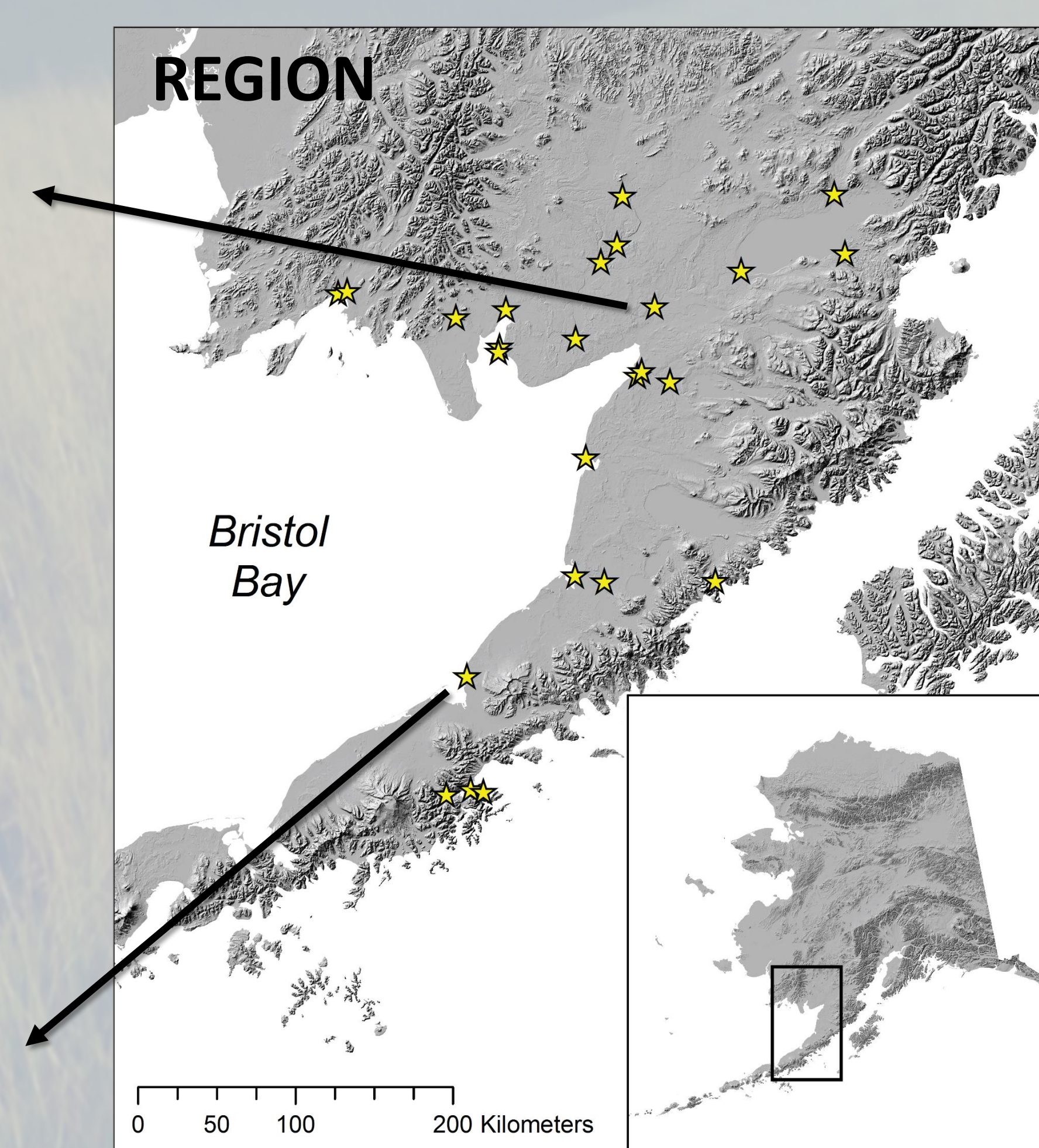
IMPORTANCE OF TEK

- Essential for developing long-term perspective on current change
- Extends record of modern and historic storm analogues
- Enhances community engagement and trust through elder participation

TEK FINDINGS

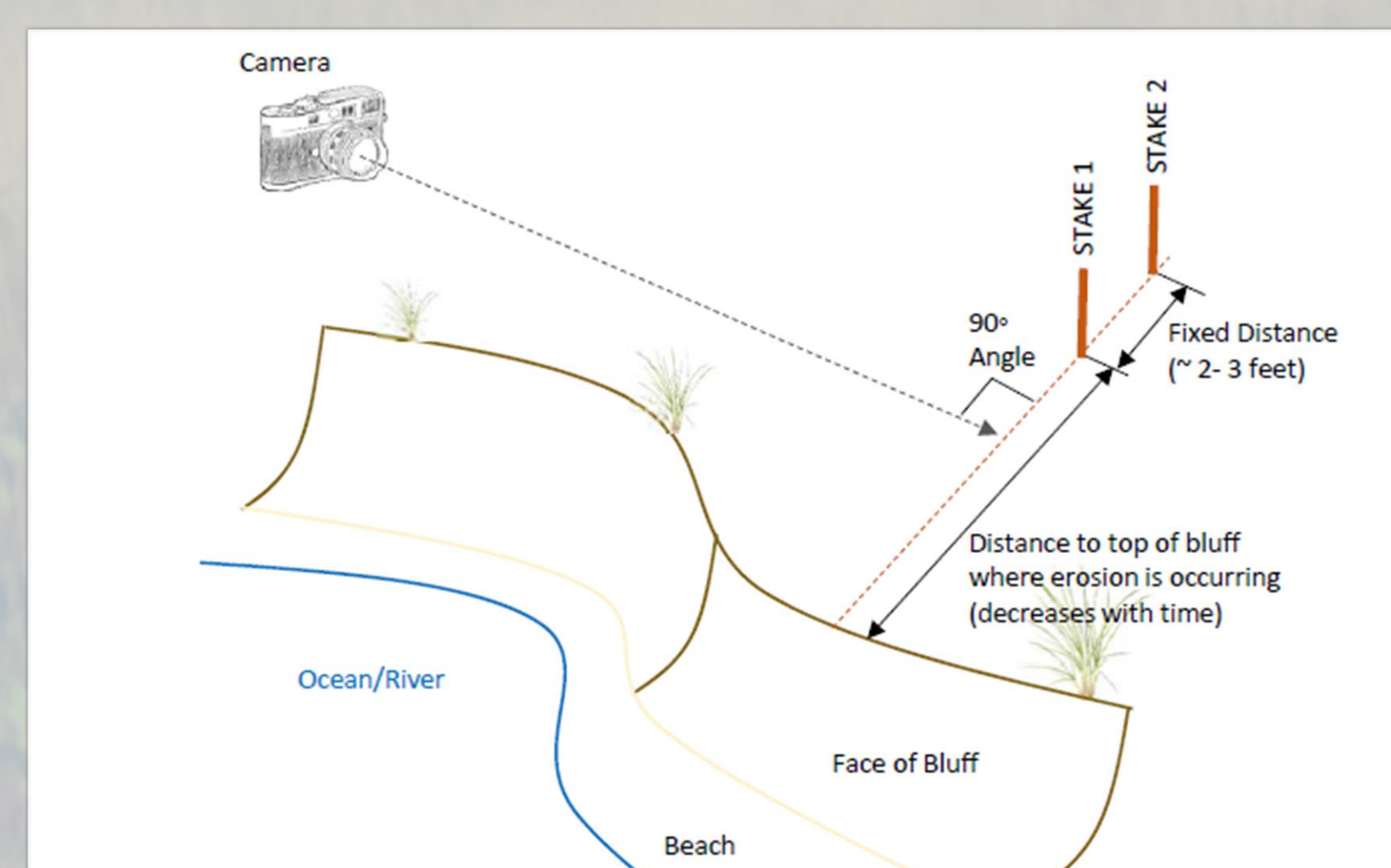
- Locations of former village, airport, and school - all destroyed by flooding
- Increase in "muck" fronting village
- Changing sea ice, hydrologic, and ecological conditions
- Lack of connection and information sharing between youth and elders

COMMUNITY-BASED SHORELINE MONITORING WITH TIME-LAPSE CAMERAS



PROJECT OVERVIEW

- Workshop for local observers to introduce coastal processes and monitoring station
- Site-visits to install stakes and help with camera set-up
- EPA Quality Assurance Project Plan (QAPP) development for future users
- Photo processing automation for long-term sustainability of photo-derived measurements



Example of camera field of view for time-lapse monitoring of bluff erosion.



CONCLUSIONS

- Spatial coverage and temporal resolution of coastal change measurements improved by community-based observations
- Modern scientific methods supported by long-term perspectives provided by TEK
- Enhanced community engagement in coastal research that promotes pathways to higher education

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